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Morphological adjustments and macroinvertebrate re-colonisation following re-meandering

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In winter 2008 the small brook Skamlebækken was converted into a meandering watercourse after 60 years as a culvert stream flowing partly underground. The remeandering included reopening and remeandering of 225 m of formerly partly culverted stream. Skamlebækken is located on the top of the moraine hills in Odsherred on Zealand, Denmark. The total length of the brook is 1600 m and just upstream of the restoration area a constructed mill pond disrupts natural morphology and hence limiting up- and downstream migration of flora and fauna. The catchment area is 1.5 km^2 and the soil types are coarse grained sandy moraine and the landscape is dominated by high gradient grazed area and partly natural peat bogs and forest.

The morphology, in-stream habitats and macro invertebrate communities were monitored once before the restoration and 5 times following the restoration; after 1, 3, 6, 12, 18 and 30 months. One upstream control site and 3 reaches affected by the restoration were monitored.

The re-meandered brook experienced substantial initial morphological adjustments. The newly excavated course was prone to a large influx of sediment from the banks. This influenced both sediment transport and deposition patterns in the stream. In-stream habitat structure changed marked as consequence of the restoration. Velocity and depth as well as stream bed sediment structure were significant altered in the new watercourse. During the 30 month recovery period analyzed here the stream gradually evolved into to a stable condition. However, at the end of the monitoring morphological adaptation processes was still working and will do so for a long period, because no steady state exist between discharge, sediment delivery and morphology.

Macro invertebrate communities were heavily affected by the restoration. The brook was devoid of any macro invertebrates just after the restoration. The community slowly recovered and by month 12 the community abundance was up to 1% of the pre-restoration level respectively. By month 18 the community was dominated by chironomids, *Gammarus pulex* and *Baetis* sp. The taxonomic structure of the community had however changed significantly and some of the poorer disperses will take years to recover due to the isolation of the brook.

The results however indicate the time scale to be expected in small streams and brook with small upland areas and can thus serve as a more solid base to judge our effect studies on restoration in small water bodies.